Section I. (Amendment to the Claims)

Please add new claim 23 as set forth in the following listing of claims 1-23 of the application.

1. (Previously presented) A method for controlling electrical heating of an element to maintain a constant electrical resistance R_s, comprising:

(a) supplying electrical power to said element in an amount sufficient for heating same and increasing its electrical resistance to R_s, while concurrently monitoring real time electrical resistance R of said element for detection of any difference between R and R_s;

(b) upon detection of a difference between R and R_s, adjusting the electrical power supplied to said element by an amount ΔW determined approximately by:

(i) $$\Delta W = \frac{m}{\alpha_\rho \times t \times R_0} \cdot (R_s - R); \text{ or}$$

(ii) $$\Delta W = \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s + R(0) - 2R]; \text{ or}$$

(iii) $$\Delta W = \frac{m}{\alpha_\rho \times R_0} \cdot \left[f_s (R_s - R) - \frac{R - R(0)}{t} \right],$$

wherein m is the thermal mass of said element, α_ρ is the temperature coefficient of electrical resistance of said element, R_0 is the standard electrical resistance of said element measured at a reference temperature, t is the time interval between current detection of electrical resistance difference and last adjustment of electric power, $R(0)$ is the electrical resistance of said element measured at last adjustment of electric power, and f_s is a predetermined frequency at which the adjustment of electric power is periodically carried out.

2. (Original) The method of claim 1, wherein the adjustment of electric power is carried out by adjusting electrical current passed through said element by an amount ΔI, determined approximately by:

$$\Delta I = \frac{\Delta W}{2IR_s},$$

wherein I is the electrical current passed through said element before the adjustment.

3. (Original) The method of claim 1, wherein the adjustment of electric power is carried out by adjusting electrical voltage applied on said element by an amount ΔV, determined approximately by:

$$\Delta V = \frac{\Delta W \cdot R_s}{2V},$$

wherein V is the electrical voltage applied on said element before the adjustment.

4. (Original) The method of claim 1, wherein ΔW is determined approximately by:

$$\Delta W = \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s + R(0) - 2R].$$

5. (Original) The method of claim 4, wherein $R(0)$ is approximately equal to R_s, and wherein ΔW is determined approximately by:

$$\Delta W = 2 \cdot \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s - R].$$

6. (Original) The method of claim 1, wherein said element comprises an electrical gas sensor for monitoring an environment that is susceptible to presence of a target gas species, wherein said gas sensor comprises a catalytic surface for effectuating exothermic or endothermic reactions of said target gas species at elevated temperatures, so that the presence

of said target gas species causes temperature change as well as electrical resistance change in said gas sensor, which responsively effectuates the adjustment of electrical power supplied to the gas sensor, wherein said adjustment of electrical power correlates to and is indicative of the presence and concentration of said target gas species in the environment.

7. (Original) The method of claim 6, wherein said electrical gas sensor comprises one or more filaments having a core formed of chemically inert and electrically insulating material and a coating form of electrically conductive and catalytic material.

8. (Original) The method of claim 6, wherein each gas-sensing cycle comprises the steps of:

(1) pre-heating said gas sensor in an inert environment devoid of said target gas species for a sufficient period so as to reach a steady state;

(2) measuring the electrical resistance of said gas sensor at said steady state and setting same as the constant value (R_s);

(3) subsequently, exposing said gas sensor to the environment susceptible of the presence of the target gas species;

(4) maintaining the electrical resistance of said gas sensor at R_s by adjusting the electrical power supplied to said gas sensor; and

(5) determining the presence and concentration of said target gas species, based on the adjustment of electrical power.

9. (Previously presented) A system for controlling electrical heating of an element and maintaining same at a constant electrical resistance R_s, comprising:

(a) an adjustable electricity source coupled with said element for providing electrical power to heat said element;

(b) a controller coupled with said element and said electricity source, for monitoring real time electrical resistance R of said element, and upon detection of a difference between R and R_s, for responsively adjusting the electrical power supplied to said element by an amount ΔW determined approximately by:

(i) $$\Delta W = \frac{m}{\alpha_p \times t \times R_0} \cdot (R_s - R);\ \underline{\text{or}}$$

(ii) $$\Delta W = \frac{m}{\alpha_p \times t \times R_0} \cdot [R_s + R(0) - 2R];\ \text{or}$$

(iii) $$\Delta W = \frac{m}{\alpha_p \times R_0} \cdot \left[f_s (R_s - R) - \frac{R - R(0)}{t} \right],$$

wherein m is the thermal mass of said element, α_p is the temperature coefficient of electrical resistance of said element, R_0 is the standard electrical resistance of said element measured at a reference temperature, t is the time interval between current detection of electrical resistance difference and last adjustment of electric power, $R(0)$ is the electrical resistance of said element measured at last adjustment of electric power, and f_s is a predetermined frequency at which the adjustment of electric power is periodically carried out.

10. (Original) The system of claim 9, wherein said controller comprises at least one electrical resistance meter.

11. (Original) The system of claim 9, wherein said controller comprises at least one electrical current meter and at least one electrical voltage meter.

12. (Original) The system of claim 9, wherein the adjustment of electric power is carried out by adjusting electrical current passed through said element by an amount ΔI, determined approximately by:

$$\Delta I = \frac{\Delta W}{2IR_s},$$

wherein I is the electrical current passed through said element before the adjustment.

13. (Original) The system of claim 9, wherein the adjustment of electric power is carried out by adjusting electrical voltage applied on said element by an amount ΔV, determined approximately by:

$$\Delta V = \frac{\Delta W \cdot R_s}{2V},$$

wherein V is the electrical voltage applied on said element before the adjustment.

14. (Original) The system of claim 9, wherein ΔW is determined approximately by:

$$\Delta W = \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s + R(0) - 2R].$$

15. (Original) The system of claim 14, wherein $R(0)$ is approximately equal to R_s, and wherein ΔW is determined approximately by:

$$\Delta W = 2 \cdot \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s - R].$$

16. (Original) The system of claim 9, wherein said element comprises an electrical gas sensor for monitoring an environment that is susceptible to presence of a target gas species, wherein said gas sensor comprises a catalytic surface for effectuating exothermic or endothermic reactions of said target gas species at elevated temperatures, so that the presence

of said target gas species causes temperature change as well as electrical resistance change in said gas sensor, which responsively effectuates the adjustment of electrical power supplied to said gas sensor, wherein said adjustment of electrical power correlates to and is indicative of the presence and concentration of said target gas species in the environment.

17. (Original) The system of claim 16, wherein said electrical gas sensor comprises one or more filaments having a core formed of chemically inert and electrically insulating material and a coating form of electrically conductive and catalytic material.

18. (Previously presented) A gas-sensing system for detecting a target gas species, comprising:

(a) an electrical gas sensor element having a catalytic surface that effectuates exothermic or endothermic reactions of said target gas species at elevated temperatures;

(b) an adjustable electricity source coupled with said gas sensor element for providing electrical power to heat said gas sensor element;

(c) a controller coupled with said gas sensor element and said electricity source, for adjusting the electrical power supplied to said gas sensor element to maintain a constant electrical resistance R_s; and

(d) a gas composition analysis processor connected with said controller, for determining the presence and concentration of said target gas species, based on the adjustment of electrical power required for maintaining the constant electrical resistance R_s,

wherein the electrical power is adjusted upon detection of an electrical resistance change in said gas sensor element, by an amount ΔW determined approximately by:

(i) $\Delta W = \frac{m}{\alpha_p \times t \times R_0} \cdot (R_s - R)$; <u>or</u>

(ii) $\Delta W = \frac{m}{\alpha_p \times t \times R_0} \cdot [R_s + R(0) - 2R]$; or

(iii) $\Delta W = \frac{m}{\alpha_p \times R_0} \cdot \left[f_s (R_s - R) - \frac{R - R(0)}{t} \right]$,

in which m is the thermal mass of said gas sensor element, α_p is the temperature coefficient of electrical resistance of said gas sensor element, R_0 is the standard electrical resistance of said gas sensor element measured at a reference temperature, t is the time interval between current detection of electrical resistance change and last adjustment of electric power, R is the electrical resistance of said gas sensor element measured at current time, $R(0)$ is the electrical resistance of said gas sensor element measured at last adjustment of electric power, and f_s is a predetermined frequency at which the adjustment of electric power is periodically carried out.

19. (Original) A method for detecting presence of a target gas species in an environment susceptible to the presence of same, comprising the steps of:

(a) providing an electrical gas sensor element having a catalytic surface that effectuates exothermic or endothermic reactions of said target gas species at elevated temperatures;

(b) pre-heating said gas sensor element in an inert environment devoid of said target gas species for a sufficient period of time, so as to reach a steady state;

(c) determining electrical resistance R_s of said gas sensor element at the steady state;

(d) placing said gas sensor element in the environment susceptible to the presence of the target gas species;

(e) adjusting electric power that is supplied to said gas sensor element so as to maintain the electrical resistance of said gas sensor element at R_s; and

(f) determining the presence and concentration of said target gas species in said environment susceptible of said gas species, based on the adjustment of electrical power required for maintaining the electrical resistance R_s.

20. (Previously presented) A method for controlling electrical heating of an element to maintain a constant electrical resistance R_s, comprising:

(a) supplying electrical power to said element in an amount sufficient for heating same and increasing its electrical resistance to R_s, while concurrently monitoring real time electrical resistance R of said element for detection of any difference between R and R_s;

(b) upon detection of a difference between R and R_s, adjusting the electrical power supplied to said element by an amount ΔW determined approximately by:

(i) $$\Delta W = r \cdot \frac{m}{\alpha_p \times t \times R_0} \cdot (R_s - R);$$ <u>or</u>

(ii) $$\Delta W = r \cdot \frac{m}{\alpha_p \times t \times R_0} \cdot [R_s + R(0) - 2R];$$ or

(iii) $$\Delta W = r \cdot \frac{m}{\alpha_p \times R_0} \cdot \left[f_s(R_s - R) - \frac{R - R(0)}{t} \right],$$

wherein r is a proportionality constant in a range of from about 0.1 to about 10, m is the thermal mass of said element, α_p is the temperature coefficient of electrical resistance of said element, R_0 is the standard electrical resistance of said element measured at a reference temperature, t is the time interval between current detection of electrical resistance difference and last adjustment of electric power, $R(0)$ is the electrical

resistance of said element measured at last adjustment of electric power, and f_s is a predetermined frequency at which the adjustment of electric power is periodically carried out.

21. (Previously presented) A system for controlling electrical heating of an element and maintaining same at a constant electrical resistance R_s, comprising:

(a) an adjustable electricity source coupled with said element for providing electrical power to heat said element;

(b) a controller coupled with said element and said electricity source, for monitoring real time electrical resistance R of said element, and upon detection of a difference between R and R_s, for responsively adjusting the electrical power supplied to said element by an amount ΔW determined approximately by:

(i) $$\Delta W = r \cdot \frac{m}{\alpha_\rho \times t \times R_0} \cdot (R_s - R);\ \underline{\text{or}}$$

(ii) $$\Delta W = r \cdot \frac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s + R(0) - 2R];\ \text{or}$$

(iii) $$\Delta W = r \cdot \frac{m}{\alpha_\rho \times R_0} \cdot \left[f_s (R_s - R) - \frac{R - R(0)}{t} \right],$$

wherein r is a proportionality constant in a range of from about 0.1 to about 10, m is the thermal mass of said element, α_ρ is the temperature coefficient of electrical resistance of said element, R_0 is the standard electrical resistance of said element measured at a reference temperature, t is the time interval between current detection of electrical resistance difference and last adjustment of electric power, $R(0)$ is the electrical resistance of said element measured at last adjustment of electric power, and f_s is a

predetermined frequency at which the adjustment of electric power is periodically carried out.

22. (Previously presented) A gas-sensing system for detecting a target gas species, comprising:

(a) an electrical gas sensor element having a catalytic surface that effectuates exothermic or endothermic reactions of said target gas species at elevated temperatures;

(b) an adjustable electricity source coupled with said gas sensor element for providing electrical power to heat said gas sensor element;

(c) a controller coupled with said gas sensor element and said electricity source, for adjusting the electrical power supplied to said gas sensor element to maintain a constant electrical resistance R_s; and

(d) a gas composition analysis processor connected with said controller, for determining the presence and concentration of said target gas species, based on the adjustment of electrical power required for maintaining the constant electrical resistance R_s,

wherein the electrical power is adjusted upon detection of an electrical resistance change in said gas sensor element, by an amount ΔW determined approximately by:

(i) $\Delta W = r \cdot \dfrac{m}{\alpha_\rho \times t \times R_0} \cdot (R_s - R)$; or

(ii) $\Delta W = r \cdot \dfrac{m}{\alpha_\rho \times t \times R_0} \cdot [R_s + R(0) - 2R]$; or

(iii) $\Delta W = r \cdot \dfrac{m}{\alpha_\rho \times R_0} \cdot \left[f_s (R_s - R) - \dfrac{R - R(0)}{t} \right]$,

in which r is a proportionality constant ranging from about 0.1 to about 10, m is the thermal mass of said gas sensor element, α_0 is the temperature coefficient of electrical resistance of said gas sensor element, R_0 is the standard electrical resistance of said gas sensor element measured at a reference temperature, t is the time interval between current detection of electrical resistance change and last adjustment of electric power, R is the electrical resistance of said gas sensor element measured at current time, $R(0)$ is the electrical resistance of said gas sensor element measured at last adjustment of electric power, and f_s is a predetermined frequency at which the adjustment of electric power is periodically carried out.

23. (New) A method for detecting presence of a target gas in an environment susceptible to the presence of same, comprising: providing an electrical gas sensor element having a catalytic surface that effectuates exothermic or endothermic reactions of said target gas at elevated temperatures; subjecting the gas sensor element to controlled heating; and determining whether the target gas is present in said environment, by response of said gas sensor element under the controlled heating.